

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
6 March 2003 (06.03.2003)

PCT

(10) International Publication Number
WO 03/018209 A1

(51) International Patent Classification⁷: **B05B 15/06**,
B65D 83/14

(21) International Application Number: PCT/GB02/03847

(22) International Filing Date: 21 August 2002 (21.08.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0120405.6 22 August 2001 (22.08.2001) GB

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

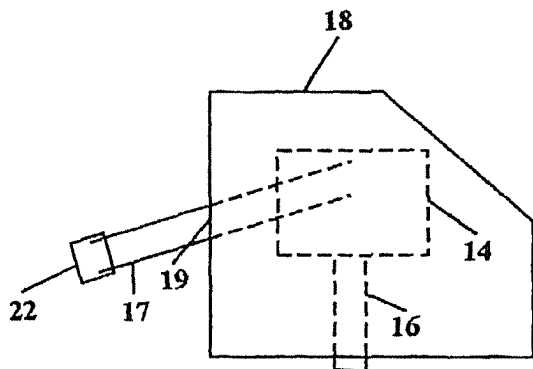
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: IMPROVEMENTS IN OR RELATING TO NOZZLES



(57) Abstract: The present invention relates to a nozzle arrangement which is adapted to actuate and control the release of the contents of a container. The nozzle arrangement is configured to fit to an outlet of said container and comprises an internal passageway; an actuator which, upon operation, actuates the release of the contents of said container into said passageway; and an extension member (17) having an outlet (22) connected to the internal passageway. At least a portion of the extension member (17) is flexible thereby enabling said extension member to be reconfigured between an extended configuration suitable for use and a storage configuration. In a further aspect the invention also relates to a container fitted with a nozzle arrangement of the present invention.

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IMPROVEMENTS IN OR RELATING TO NOZZLES

This invention relates to improvements in or relating to nozzles.

Nozzles are commonly used in conjunction with pressurised aerosol containers to actuate and control the release of the product contained in the aerosol container. Finger pump or trigger nozzle devices are also widely used to actuate and control the release of a wide range of products from non-pressurised containers.

In certain circumstances it is necessary or desirable to be able to direct the product ejected through a nozzle to a precise location or area. This can be achieved to a certain extent with conventional nozzles, but it can be a particular problem if the product is required to be directed into a confined or a "hard to reach" location.

One known approach to address this problem involves the attachment of a straight plastic tube to the outlet of a nozzle. This results in fluid ejected through the nozzle outlet being directed along the bore of the plastic tube instead and exiting at the opposing end of the tube. Using this arrangement it is possible to direct the product to a specific location and, in addition, the tube can be used to access confined spaces and hard to reach locations.

However, there are a number of problems associated with this known arrangement. Firstly, the plastic tube is provided as a separate component which cannot be conveniently stored on the container. This means that the tube can easily be misplaced or lost altogether. Secondly,

when the tube is fitted to the nozzle arrangement, the quality of the spray generated at the opposing end of the tube (i.e. the droplet size distribution and extent of dispersion of the spray droplets produced) can be adversely affected.

5 It is an object of the present invention to provide a nozzle arrangement to actuate and control the release of the contents of a container in which the above-mentioned problems are obviated or at least minimised.

10 It is also an object of the present invention to provide a nozzle arrangement that is more convenient to use and which is suitable for directing a spray into a confined space or a hard to reach location.

15 In accordance with a first aspect of the present invention there is provided a nozzle arrangement which is adapted to actuate and control the release of the contents of a container, said nozzle arrangement being configured to be fitted to an outlet of said container and comprising:

- (i) an internal passageway;
- (ii) an actuator which, upon operation, actuates the release of the contents of said container into said passageway; and
- (iii) an extension member having an outlet connected to the
20 internal passageway;

wherein at least a portion of the extension member is flexible thereby enabling said extension member to be reconfigured between an extended configuration suitable for use and a storage configuration.

It shall be understood that by "flexible" it is meant that the extension member can be folded, bent, coiled or flexed and subsequently returned to the unfolded, unbent, uncoiled or unflexed configuration without imparting any damage to the structural integrity of the extension member.

The nozzle arrangements of the present invention can be used to conveniently generate and direct a spray into a confined spaces or hard to reach locations. Furthermore, the flexible portions of the extension member enable it to be converted between an extended configuration which is suitable for use and a storage configuration. This storage configuration enables the extension member to be placed in a convenient storage position on the container, thereby reducing the possibility of misplacing or losing the extension member.

The main application of the nozzle arrangements of the present invention relates to products where a spray is required with good directional control and/or directional control. Typical applications include, for example, products which contain lubricants, water repellents (such as the product sold by WD40 Company Limited under the trade name WD40), other penetrative oils, glues, paint sprays, deodorant sprays for spraying into shoes, toilet cleaners, insecticides, veterinary and pharmaceutical products.

In the "extended configuration suitable for use" the extension member, or at least a substantial portion thereof, is preferably in the form

of a substantially straight and elongate protrusion which enables the spray to be directed towards or into the desired location.

In the "storage configuration" the extension member may be placed in any convenient storage position. This will invariably require at least a
5 portion of the extension member to be bent, coiled or folded. For example, the extension member may be bent or coiled around either the container *per se* or the nozzle arrangement. In the case where the extension member is wound around the nozzle arrangement, the extension member preferably fits within a cap which is fitted to the container and
10 which covers the nozzle arrangement. In most cases it is preferable that the storage configuration for the extension member is compact, i.e. the extension member is bent or coiled up into a more compact form. In some embodiments, the extension member may comprise one or more folds to provide a compact storage configuration, again to enable
15 convenient storage on the container. Alternatively, the extension member may simply hang down the side of the container or be releasably secured to the side of the container in the storage configuration. However, regardless of the actual storage configuration used, it is an important feature of the present invention that the extension member may be
20 reconfigured into the extended position prior to use.

Preferably the extension member is an elongate tube. Most preferably, the extension member is a plastic tube. In some embodiments of the invention, it is preferable that the entire length of the plastic tube is

flexible to enable the tube to be folded, bent or coiled at any position along its length into a compact storage configuration.

In a first preferred embodiment of the invention, the extension member is an elongate plastic tube provided with corrugations or
5 castellations formed in the tube wall along at least a portion of its length. These corrugations or castellations function in a similar manner to the corrugated sections of a drinking straw, i.e. they enable the extension tube to be reconfigured between an extended configuration and a storage configuration by enabling the formation and removal of bends or folds in
10 the region of the tube provided with the corrugations or castellations. The corrugations or castellations in the tube wall enable the tube wall to become compressed on one side and extended on the opposing side the tube, thereby allowing the tube to be bent or folded and subsequently straightened. In some embodiments the entire length of the tube wall has
15 corrugations or castellations formed therein.

In a second preferred embodiment of the present invention, the extension member is an elongate plastic tube which is provided with a wire along at least a portion of its length. The wire may be inserted within the bore of the tube (without preventing the flow of fluid), wound
20 around the outside of the tube, or moulded within the plastic wall of the tube. The wire allows the plastic tube to be reconfigured between an extended configuration suitable for use and a storage configuration by enabling the formation and subsequent removal of bends, coils or folds in

the region of the tube in which the wire is present. In some embodiments the wire may extend for the entire length of the tube.

The extension member preferably includes a spray modifying arrangement at, in or adjacent to, the outlet of the extension tube. Preferably, it is fitted into the outlet of the extension tube. The spray modifying arrangement modifies the properties characteristics (i.e. droplet size distribution and dispersion) of the spray droplets ejected through the outlet of the extension member. The spray modifying arrangement may be formed integrally within the extension member or may be separate component which is attached thereto.

The modifying arrangement may comprise certain internal spray-modifying structures, such as one or more expansion chambers, one or more inner orifices, one or more swirl chambers, multiple internal channels, or one or more venturi chambers. The effect of these internal spray-modifying structures is described in WO 01/89958, the entire contents of which are incorporated herein by reference.

It is preferable that the spray-modifying arrangement is fitted to the end of the extension tube and comprises a swirl chamber having an outlet orifice formed therein. Swirl chambers are commonly used in nozzle arrangements and are available, or can be readily moulded, as inserts suitable for fitting to the end of the extension tube. A typical swirl chamber comprises four separate inlet channels which direct fluid into the swirl chamber. In use, fluid passing through the extension member can be

diverted into these channels by providing a body which extends into the bore of the tube and diverts the flow towards the inlet channels.

The net effect of the provision of a spray-modifying arrangement is that the droplets size distribution of the spray produced can be
5 dramatically improved and controlled to be optimal for the application concerned.

In most cases it is preferable that the extension member is integrally formed with, or permanently attached to, the nozzle arrangement. In effect this provides the nozzle arrangement with a
10 permanently attached extension to the internal passageway, thereby obviating the problem of the extension member being a separate item which can easily be misplaced or lost.

In some cases, however, an extension member comprising a spray-modifying arrangement at, in or adjacent to the outlet of the extension
15 member may be separable from said nozzle arrangement, thereby enabling the extension member to be releasably connectable to said nozzle arrangement when required. Although this is generally not preferred, it does enable the nozzle arrangement to be operated either with or without the extension member present.

20 The nozzle arrangement may be a pump or trigger nozzle device. In such devices the actuator is the pump or trigger itself, which, upon operation, causes the contents of the container to which the nozzle arrangement is attached to be ejected.

In most cases, however, the canister will be a pressurised aerosol canister and the actuator of the nozzle arrangement will be configured to releasably engage with an outlet valve of the aerosol canister. Accordingly, the actuation of the actuator of the nozzle arrangement causes the outlet valve of the canister to open, thereby allowing the contents of the container to access the internal passage of the nozzle arrangement. Preferably, the nozzle arrangement is in the form of a spray-through cap which can be fitted to the end of the aerosol canister surrounding the outlet valve. The cap is preferably provided with an actuator portion which is flexible or otherwise adapted to enable movement relative to the cap so that the actuator portion may be moved into and out of engagement with the outlet valve of the canister. This enables the actuation of the release of the contents simply by pressing the actuator portion of the spray through cap. It is preferable that the spray-through cap comprises an aperture in the cap to allow access to the actuator portion without removal of the cap. An example of a so-called spray through cap nozzle arrangement is described in the applicant's co-pending International PCT Patent Application No. PCT/GB01/02036 (which is published as WO 01/89958).

It is also preferred that the spray through cap is provided with an aperture through which a permanently attached extension member can protrude. It is especially preferred that the extension member can be coiled up inside the spray through cap (in a similar manner to a coiled garden hose pipe) to form a compact storage configuration with the outlet

of the extension member being accessible through the aperture defined in the cap and thereby enabling the extension member to be extended through the aperture by a user pulling the end of the extension member through the aperture. This pulling action causes the extension member to
5 uncoil from the compact configuration inside the cap into an extended configuration which protrudes from the cap. This enables the required amount of extension member to be extended for use. After use the extension tube can be pushed back into the cap.

Alternatively, the extension member can either hang by the side of
10 the aerosol container or be releasably secured to the side of the container.

According to a second aspect of the present invention there is provided a container having an outlet fitted with a nozzle arrangement as hereinbefore defined.

The invention will now be described further by way of example only
15 and with reference to the accompanying drawings in which:

Figure 1 shows a diagrammatic representation of a part of a prior art form of nozzle arrangement;

Figure 2 shows a diagrammatic side view of a part of one form of nozzle arrangement according to the present invention;

20 **Figure 3** shows a plan view of the part of the nozzle arrangement of Figure 2; and

Figure 4 shows a diagrammatic representation of a spray insert for use with the nozzle arrangement, a part of which is shown in Figures 2 and 3.

A known nozzle arrangement is shown diagrammatically in Figure 1. The nozzle arrangement 11 is a so-called button nozzle which fitted directly over an outlet of an aerosol canister (not shown). In use, the body of the button nozzle arrangement is pushed downwards (towards the aerosol canister) by an operator in the direction of arrow 10 to actuate the release of the contents of the aerosol canister. Depressing the nozzle arrangement 11 in this manner causes the outlet valve of the aerosol canister to open and the contents to be discharged through a nozzle outlet 12 provided in the body during normal operation. However, instead of generating a spray through the nozzle outlet 12, a plastic tube extension tube 13 can be releasably attached into the nozzle outlet 12, as shown in Figure 1. This causes fluid to flow along the extension tube and exit at the outlet 13a thereof.

With the extension member 13 attached, greater directional control can be achieved when the contents of an aerosol container (not shown) are released. However, the properties of the spray (i.e. droplet size, distribution etc.) ejected at the outlet 13a of the extension member 13 are adversely affected.

Figure 2 shows a diagrammatic representation of one embodiment of a nozzle arrangement in accordance with the present invention. The nozzle arrangement is in the form of a spray-through cap nozzle arrangement which is fitted to the end of an aerosol container (not shown). The cap has a body 18 inside of which there is an actuator portion 14 which engages with an outlet valve 16 of the container (not

shown). In side the actuator portion 14 is an internal passageway which, in use, enables the fluid released from the outlet valve by actuation of the actuator 14 to be directed through the actuator 14 and access a tubular extension member 17. The tubular extension member 17 is in the form of
5 a flexible plastic tube which is permanently connected to the internal passageway in the actuator 14. The extension member 17 extends through an aperture 19 in the body 18. The cap body 18 is provided with a further aperture 21 on the upper surface thereof (shown in the plan view of Figure 3) on the upper surface thereof which enables the actuator
10 portion 14 to be reached and hence, a user to contact the actuator portion to actuate the opening of the outlet valve 16 of the container.

In this embodiment the actuator portion 14 is not connected to the cap body 18. However, in alternative embodiments of the invention the cap body can be moulded so that the actuator portion is an integral part
15 thereof which is flexible or moveable relative to the remainder of the cap and is arranged such that said part is in an actuating engagement with the outlet valve of the aerosol canister 16. Nozzle arrangements of this type are described in the applicant's co-pending International patent application No. PCT/GB01/02036 (WO 01/89958).

20 In use, the extension member 17 is withdrawn from the cap 18 by pulling the exposed end until a sufficient length extends beyond the aperture 19 of the cap for use. The actuator portion 14 can then be actuated in the manner described above to cause the opening of the outlet valve 16 and the release of the contents of the container through the

extension member 17. Once completed, the extension member 17 can be reinserted into the cap 18 by pushing the tubular member 17 back into the cap via the aperture 19.

A preferred embodiment of the present invention is shown in Figure 3 in which the nozzle arrangement is arranged such that the tubular extension member 17 is wound round the container outlet valve 16. The winding/unwinding of the extension member is effected by the rotation of the cap body 18 relative to the actuator member 14. Accordingly, when coiled around the outlet valve 16, the extension member 17 is in a compact storage configuration, whereas pulling the outlet of the extension member out of the aperture in the cap body 18 results in the extension member being converted from the compact storage configuration to an extended configuration.

As mentioned above, use of the extension member 17 has a deleterious effect on the properties of the spray generated as the contents of the aerosol container emerge from through the outlet of the extension member 17. In order to address this problem, it is possible to incorporate within the dispense member 17, or attach thereto, a spray-modifying arrangement 22. The modifying arrangement 22 comprises a swirl chamber having an outlet formed therein. In use, fluid flowing through the extension member 17 is caused to enter the swirl chamber where rotational flow is induced in the fluid flow resulting in the atomisation of the droplets ejected through the outlet formed in the swirl chamber.

An alternative embodiment of the spray-modifying arrangement 22, when formed as a separate insert for attachment to the dispense member, is shown in Figure 4. This alternative embodiment comprises an attachment tail 23 for engagement with the open end of the tubular extension member 17 and a nozzle outlet 24. A fluid flow bore (not shown) extends through the insert and a central part 26 of the insert may be configured with any of the features described in the WO 01/89958 to give the desired spray characteristics at the outlet.

It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiment which are described by way of example only.

CLAIMS

1. A nozzle arrangement which is adapted to actuate and control the release of the contents of a container, said nozzle arrangement being configured to be fitted to an outlet of said container and comprising:
 - 5 (i) an internal passageway;
 - (ii) an actuator which, upon operation, actuates the release of the contents of said container into said passageway; and
 - (iii) an extension member having an outlet connected to the internal passageway;
- 10 wherein at least a portion of the extension member is flexible thereby enabling said extension member to be reconfigured between an extended configuration suitable for use and a storage configuration.
2. A nozzle arrangement according to Claim 1, wherein said extension member is integrally formed with said nozzle arrangement.
- 15 3. A nozzle arrangement according to Claim 1 or Claim 2, wherein said extension member is in the form of an elongate tube.
4. A nozzle arrangement according to any preceding claim, wherein said extension member is a plastic tube.
5. A nozzle arrangement according to Claim 4, wherein said plastic
- 20 tube is flexible along its entire length.
6. A nozzle arrangement according to any preceding claim, wherein said extension member is bent, coiled or folded in said storage configuration.

7. A nozzle arrangement according to claim 6, wherein said extension member is bent or coiled around either the nozzle arrangement or the container in said storage configuration.
8. A nozzle arrangement according to Claim 7, wherein said extension member is coiled up around the nozzle arrangement stored within a cap of said container which covers said nozzle arrangement.
9. A nozzle arrangement according to Claim 6, wherein said extension member comprises one or more folds to form a compact storage configuration.
10. A nozzle arrangement according to Claim 9, wherein said extension member either hangs down at the side of the container or is releasably secured to the side of the container in said storage configuration.
11. A nozzle arrangement according to any one of the preceding claims, wherein said extension member is an elongate plastic tube that is provided with corrugations along at least a portion of its length, said corrugations enabling the tube to be reconfigurable between the extended configuration suitable for use and the storage configuration by enabling the formation and removal of bends, coils or folds in the tube in the region of said corrugations.
12. A nozzle arrangement according to any one of Claims 3 to 10, wherein said extension member is an elongate plastic tube which comprises a wire either inserted within, around or moulded within the plastic wall of the tube, said wire extending over at least a portion of the length of the tube and enabling the tube to be reconfigurable between

said extended configuration suitable for use and said storage configuration by enabling the formation and removal of bends, coils or folds in the tube in the region of said wire.

13. A nozzle arrangement according to any one of claims 3 to 10,
5 wherein said extension member is an elongate plastic tube which comprises one or more flattened dome or equivalent shaped regions which enable the tube to be folded, coiled or bent into a suitable storage configuration and subsequently returned to the extended configuration.

14. A nozzle arrangement according to any one of the preceding claims,
10 wherein said extension member is substantially straight and elongate in said extended configuration.

15. A nozzle arrangement according to any one of the preceding claims, wherein said extension member is provided with a spray modifying arrangement at, in, or adjacent to, the outlet of the extension member,
15 said spray modifying arrangement being configured to modify the properties of the spray droplets ejected through the outlet of the extension member.

16. A nozzle arrangement according to Claim 15, wherein said spray modifying arrangement is integrally formed with said extension member.

20 17. A nozzle arrangement according to Claim 15, wherein said spray modifying arrangement is a separate component which may be fitted to the open end of the extension member.

18. A nozzle arrangement according to Claims 15 or 17, wherein said spray modifying arrangement comprises a swirl chamber having an outlet formed thereto through which a spray is ejected.

19. A nozzle arrangement according to Claims 15 or 17, wherein said
5 spray modifying arrangement additionally comprises an additional spray modifying feature selected from the group consisting of one or more expansion chambers, one or more inner orifices, one or more venturi chambers, and multiple inner channels.

20. A nozzle arrangement according to any preceding claim wherein
10 said nozzle arrangement is a pump or trigger nozzle arrangement and said actuator is the pump or trigger.

21. A nozzle arrangement according to any one of Claims 1 to 19, wherein said canister is a pressurised aerosol canister and the actuator of said nozzle arrangement is configured to releasably engage with an outlet
15 valve of said aerosol canister such that actuation of the actuator of the nozzle arrangement causes said outlet valve of the canister to open, thereby allowing the contents of the container to access the internal passage of the nozzle arrangement.

22. A nozzle arrangement according to Claim 21, wherein said nozzle
20 arrangement is in the form of a spray through cap which is fitted to an end of the aerosol canister surrounding the outlet valve of the canister, said cap being provided with an actuator portion which can engage with said outlet valve thereby enabling the actuation of the release of the contents by pressing the actuator portion of the spray through cap.

23. A nozzle arrangement according to Claim 22, wherein said spray through cap is provided with an aperture through which the extension member can be extended for use.

24. A nozzle arrangement according to Claim 23, wherein said
5 extension member is coiled up inside the cap in the compact configuration with the end of the extension member accessible through the aperture in the cap thereby enabling said extension member to be extended through said aperture by pulling on the end of the and causing the extension member to unwind to the desired extent.

10 25. A nozzle arrangement according to Claim 22, wherein said extension member can either hang by the side of the aerosol container or be releasably secured to the side of the container.

26. A nozzle arrangement according to any one of Claims 15 to 25, wherein said extension member comprises a spray modifying arrangement
15 at, in or adjacent to, the open end of extension member and is separable from said nozzle arrangement, thereby enabling the extension member to be releasably connectable to said nozzle arrangement when required.

25. A container having an outlet fitted with a nozzle arrangement as defined in any preceding claim.

20 26. A container as claimed in Claim 25, wherein said container is a pressurised aerosol container.

27. A container as claimed in Claim 25, wherein said nozzle arrangement is a trigger or pump spray device and said container is a non-pressurised container.

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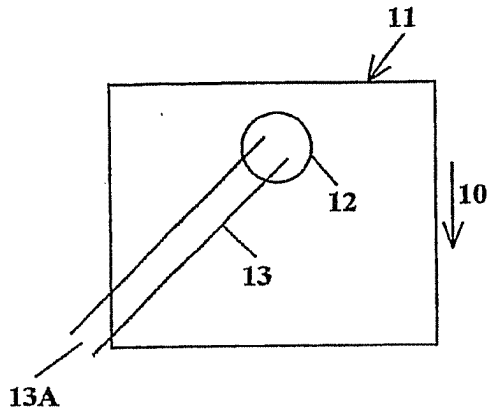


Fig. 1

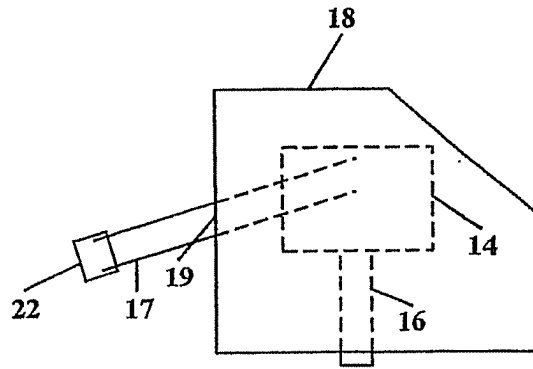


Fig. 2

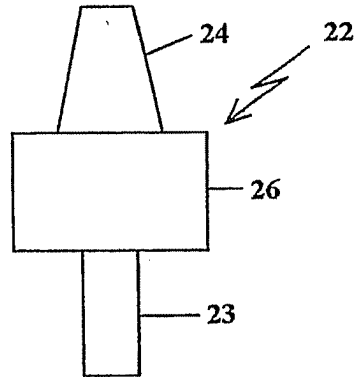


Fig. 4

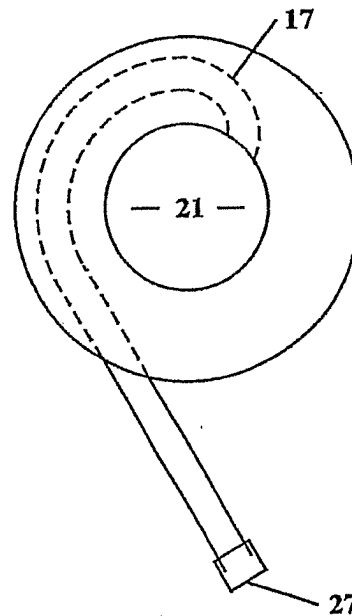


Fig. 3

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 02/03847

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B05B15/06 B65D83/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B05B B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 029 599 A (SANKYO RYOKKA COMPANY LIMITED) 23 August 2000 (2000-08-23)	1-6, 9-12, 14-23, 25-29
A	abstract paragraph '0008! - paragraph '0011! paragraph '0027! paragraph '0032! paragraph '0034! - paragraph '0037! figures --- -/-	7,8,13, 24

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

A document defining the general state of the art which is not considered to be of particular relevance

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C document referring to an oral disclosure, use, exhibition or other means

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T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search

16 December 2002

Date of mailing of the international search report

23/12/2002

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 02/03847

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 540 359 A (GOBBEL KEITH) 30 July 1996 (1996-07-30) abstract column 5, line 24 -column 6, line 49 column 7, line 1 -column 8, line 65 figures	1-9, 13-15, 17-24, 26-29
A		10-12, 16, 25
X	US 4 684 032 A (TSAY SHUNG-DER) 4 August 1987 (1987-08-04) the whole document	1-8, 13, 15, 17, 20, 27, 29

INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/GB 02/03847

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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US 5540359	A	30-07-1996	US 5799835 A	01-09-1998
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